

CZECHOSLOVAKIA / Chemical Technology, Chemical Products and Their H-31  
Application. Caoutchouc, Natural and Synthetic.  
Rubber.

Abs Jour : Ref Zhur - Khimiya, No 5, 1959, No. 17728

Author : Beniska, J.; Dogadkin, B.

Inst : Not given

Title : Effect of Promoters on the Vulcanization Process I.  
Action of ZnO on the Rate of Reaction Involving Addition  
of Sulfur to Caoutchouc

Orig Pub : Chem. zvesti, 1958, 12, No 5, 304-311

Abstract : Effects of ZnO and stearic acid (I) on the kinetics of  
S addition to SKB caoutchouc without accelerating agents  
and in mixtures containing such accelerating agents as  
mercaptobenzothiazole (II) and diphenylguanidine were  
investigated. ZnO does not affect the above reaction of  
mixtures of SKB from which the traces of caustic were

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CZECHOSLOVAKIA / Chemical Technology, Chemical Products and Their      H-31  
Application. Caoutchouc, Natural and Synthetic.  
Rubber.

Abs Jour : Ref Zhur - Khimiya, No 5, 1959, No. 17728

removed and which contained no accelerators. In the  
mixtures with II ZnO causes retardation and with I  
causes acceleration of the addition reaction of S with  
caoutchouc. In the presence of ZnO, zinc sulfide is  
formed during vulcanization with the reaction being  
further promoted by neozone D and I.

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DOGADKIN, B. A., TARASOVA, Z. N., BAS'KOVSKAYA, M. O. and KAPLUNOV, M. Ya.  
(Scientific Research Institute of the Tire Industry.)

"The Formation of Vulcanization Structures and Their Modification by Thermo-Chemical Reaction and Fatigue."

Isotopes and Radiation in Chemistry, Collection of Papers of the  
All-Union Sci. Tech. Conf. on Use of Radioactive and Stable Isotopes and  
Radiation in National Economy and Science, Moscow, Vol. 2, IZV. AN SSSR, 1968, 180pp.

This volume publishes the reports of the Chemistry Section of the  
All-Union Sci. Tech. Conf. on Use of Radioactive and Stable Isotopes and Radiation  
in Science and the National Economy, sponsored by Acad. Sci. USSR and Main  
Admin for Utilization of Atomic Energy under Council of Ministers USSR,  
Moscow, 4-12 April 1967.

20-119-6-33/56

AUTHORS:

Dogadkin, B., <sup>A.</sup> Pechkovskaya, K., Gol'dman, E.

TITLE:

On the Structure and the Reinforcing Action of Colloidal Silicic Acid as Filler of Synthetic Rubber ( O strukture i usilivayushchem deystvii kolloidnoy kremnekisloty kak napolnitelya sinteticheskogo kauchuka)

PERIODICAL:

Doklady Akademii nauk SSSR, 1958, Vol. 119, Nr 6, pp. 1170 - 1173 (USSR)

ABSTRACT:

This work investigates the character of the distribution of the colloidal silicic acid as representative of a new glass of intensifiers in sodium-butadiene rubber. This test object also was chosen for the following reason: Of the same raw material and also by the same method, only varying of the conditions of the technological process, samples of colloidal silicic acid with essentially different reinforcing effect can be produced. From this the possibility of the comparison of active and inactive fillers results. For the performance of these experiments a series of samples of colloidal silicic acid with high, mean, and low

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On the Structure and the Reinforcing Action of  
Colloidal Silicic Acid as Filler of Synthetic Rubber

reinforcing action in rubber sorts of sodium-butadiene rubber was produced. The chemical composition of these samples practically was equal and they also differed only very little with regard to the specific surface, pH, and various adsorption characteristics. But the rubber mixtures produced on the base of sodium-butadiene rubber, which contain the samples mentioned have an essentially different structure of the mixture and also essentially different physical-mechanical properties of the vulcanisates. The degree of the structuring of the filler in the mixture is characterized by the lixivation coefficient which is determined by the share of the filler, which passes over into the basic solution, in its total content in the mixture. A diagram illustrates the dependence of the lixivation coefficient on the rate of filling for samples of colloidal silicic acid of the highest or lowest reinforcement coefficient resp. (active resp. inactive samples). The most active silicic acid is leached out much easier than the inactive one. The higher the lixivation coefficient is for a given system the stronger marked are also the strength properties of the vulcanisate.

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On the Structure and the Reinforcing Action of  
Colloidal Silicic Acid as Filler of Synthetic Rubber

20-119-6-33/56

The activity of the colloidal silicic acid can be decreased considerably by heating at 600°C. There are 4 figures, 3 tables, and 7 references, 3 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute of Tire Industry)

PRESENTED: December 25, 1957, by P. A. Rebinder, Member, Academy of  
Sciences, USSR

SUBMITTED: December 12, 1957

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SOV/138-58-7-2/19

AUTHORS: Dogadkin, B.A., Eyttingon, I.I., Tarasova, Z.N., Khromov, M.K., and Strel'nikova, N.P.

TITLE: The Use of Alkylphenolaldehyde Sulphide Resins for Increasing the Adhesion and Strength of Bonds in Products Made from Butadiene-styrene Rubber (Primeneniye alkil-fenolal'degid sul'fidnykh smol dlya povysheniya kleykosti i prochnosti svyazi v izdeliyakh iz butadiyen-stiroł'nogo kauchuka)

PERIODICAL: Kauchuk i rezina, 1958, Nr 7, pp 5 - 10 (USSR)

ABSTRACT: Alkylphenolaldehyde sulphide resins increase the adhesion of butadiene-styrene rubber (Ref 1). These resins are obtained by treating the condensation product of n-tert.-butylphenol and formaldehyde with  $\text{SCl}_2$  or  $\text{S}_2\text{Cl}_2$  in an alkaline medium. The condensation product was dissolved in dry dichlorethane and a 20% solution was treated at a temperature equalling its boiling point with  $\text{SCl}_2$ , diluted in an equal amount of dichlorethane. The boiling mixture was agitated for 90 minutes and the dichlorethane distilled in a vacuum at  $60^\circ\text{C}$ . The softening point of the formed resin =  $53 - 55^\circ\text{C}$ . On further heating to  $135^\circ\text{C}$ , the softening point increased from  $70$  to  $120^\circ\text{C}$ .

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SOV/138-58-7-2/19

The Use of Alkylphenolaldehyde Sulphide Resins for Increasing the Adhesion and Strength of Bonds in Products Made from Butadiene-styrene Rubber

The initial condensation product had an average molecular weight of 260 and the following composition: 75.0% C, 9.2% H, 15.8% O. The molecular weight of the end product = 589 and had the following composition: 73.0% C, 8.6% H, 12.1% O, 6.3% S. The disulphide resins B were prepared by treating the condensation product of alkylphenol and formaldehyde with  $S_2Cl_2$  in substantially the same way as alkylphenolaldehyde monosulphide resins. The molecular weight of this resin = 589 which was approximately equal to the calculated value (585). Sulphide resins C were prepared from alkylphenol formaldehyde lacquer resins Nr 101 (VTO MKhP 2196-50) which is prepared by condensing n.-tert.-butylphenol with formaldehyde in an alkaline medium, and subsequently neutralising it with  $H_2SO_4$  and hardening at 140 °C. The physico-mechanical properties of adhesives based on butadiene-styrene rubber SKS-30A containing sulphide resins and vulcanised in the

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SOV/138-58-7-2/19

The Use of Alkylphenolaldehyde Sulphide Resins for Increasing the Adhesion and Strength of Bonds in Products Made from Butadiene-styrene Rubber

absence of sulphur or accelerators for 60 minutes at 143 °C, are listed (Table 1). Sulphide resins increase the degree of vulcanisation but alkylphenolaldehyde resins decrease the degree of vulcanisation of rubbers based on SKS-30A (Table 2). The sulphide resins impart to the resins high moduli and a high degree of break-strength. Sulphide resins have the same degree of thermal stability and resistance to ageing as rubbers not containing these resins or phenolaldehyde resins. 60% of the total amount of sulphur, introduced into the rubber in the form of a resin, is chemically bound to the rubber. Sulphide resins also strengthen the rubber. From Table 3, it can be seen that the sulphide resins increase the dynamic modulus, internal friction and the strength of the rubbers. The effect of sulphide resins on the adhesive properties of adhesives based on SKB-30A is shown in Figure 2 and Table 4. An increase in the content of sulphur and accelerators (up to 5-10%) results in increased efficiency of the rubbers (Figure 3). The degree of deformation was

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The Use of Alkylphenolaldehyde Sulphide Resins for Increasing the Adhesion and Strength of Bonds in Products Made from Butadiene-styrene Rubber

found to be in an inverse proportion to the modulus. However, an increase in the content of sulphur and accelerators in the adhesives achieves better co-ordination of various layers and a very strong layer is formed in the contact region. Sulphide resins are very good adhesives. An increase in the strength of the bond of the vulcanised rubbers is achieved without lowering the adhesive properties. The investigated alkylphenolaldehyde resins inhibit the vulcanisation of rubbers and thus decrease the strength of the bonds. Resins which simultaneously decrease the degree of vulcanisation of the rubbers as, for instance, resin Nr 101, decrease also the strength of the bonds of the rubbers.

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The Use of Alkylphenolaldehyde Sulphide Resins for Increasing the Adhesion and Strength of Bonds in Products Made from Butadiene-styrene Rubber

There are 3 Figures, 4 Tables and 6 references, 2 of which are English and 4 Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tyre Industry)

Card 5/5

1. Resins--Applications
2. Synthetic rubber--Bonding
3. Synthetic rubber--Properties

DOGADKIN, B.A.; FEL'DSHTEYN, M.S.; EYFIMOV, I.I.; PEVNER, D.M.

Action of some heterocyclic disulfides as agents and accelerators of vulcanization. Kauch. i rez. 17 no.9:7-12 S '58. (MIRA 11:10)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.  
(Vulcanization) (Sulfides)

GUL', V.Ye.; FEDYUKIN, D.L.; DOGADKIN, B.A.

Effect of change in molecular interaction on the dynamic aging of  
vulcanized rubber. Kauch. i rez. 17 no.9:16-20 S '58. (MIRA 11:10)

1. Moskovskiy institut tonkey khimicheskoy tekhnologii imeni M.V.  
Lomonosova.

(Rubber, Synthetic--Testing)

DOGADKIN, B.A.

Vulcanization systems for tire rubbers. Kauch. i rez. 17 no.11:  
6-11 N '58. (MIRA 11:12)

(Vulcanization)

DOGADKIN, B.A.; KULEZNEV, V.N.

Formation of gel in the plasticization of natural rubber and its effect on the strength of vulcanizates [with summary in English].  
Koll.shur. 20 no.5:674-675 S-O '58. (MIRA 11:11)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni M.V. Lomonosova.

(Rubber)

*DOGADKIN, B. A.*

69-20-1-7/20

AUTHORS: Dogadkin, B.A., Kuleznev, V.N., Tarasova, Z.N.

TITLE: Formation and Properties of Interpolymers of Natural and Butadiene-Styrene Rubbers (Polucheniye i svoystva mezhpolymerov natural'nogo i butadienstirol'nogo kauchukov)

PERIODICAL: Kolloidnyy Zhurnal, 1958, Vol. XX, # 1, pp 43-51 (USSR)

ABSTRACT: The coplastication of natural and butadiene-styrene rubbers by milling on a cold mill leads to the formation of an interpolymer containing 30% of the natural rubber introduced. The plastication was carried out on a specially constructed micro-mill in a hermetic casing. The milling was done in an atmosphere of purified nitrogen. The rubbers were preliminarily purified by hot acetone (natural rubber) or hot methanol (Butadiene-styrene rubber). The values for the characteristic viscosity and plasticity during milling are represented in figures 1 and 2. To prove the formation of an interpolymer during milling, several methods were used. In one, fractional precipitation, a selective precipitator had to be found; used was a binary mixture (1 : 4) of benzene-methylethylketone, in which

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69-20-1-7/20

Formation and Properties of Interpolymers of Natural and Butadiene Styrene Rubbers

butadiene-styrene rubber dissolves completely, whereas natural rubber does not dissolve. For comparison the milled polymers were also dissolved. The solution was then separated, evaporated, and the content of natural rubber determined by an Abbe refractometer. Fig. 3 shows that in case of separately milled polymers the natural rubber begins to dissolve after 40 min. For selective vulcanization, polychloro-compounds were used, which do not vulcanize natural rubber. As an activator, ZnO and PbO in two parallel experiments was employed. The results have shown that 20-26% of the introduced natural rubber is being bound during plastication. The characteristic viscosity depends on the ratio of the rubbers in the mixture. Fig. 5 shows, that the values for the viscosity of the jointly milled polymers are higher than the corresponding values of the separately milled polymers. The investigation of the physical-chemical properties of the vulcanizates shows that the mixtures of natural and butadiene-styrene rubbers have a higher resistance to aging than natural rubber alone. The resistance to breaking, relative stretching and deformation is also dependent on the composition

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69-20-1-7/20

Formation and Properties of Interpolymers of Natural and Butadiene Styrene Rubbers

of the mixture. An adhesive film made from interpolymers increases the binding strength between natural and butadiene - styrene rubbers when placed between them. It is supposed that the segments of the molecules of the natural rubber in the interpolymer, which are connected with the butadiene-styrene rubber by chemical bonds, penetrate easily into the natural rubber. The same is true for the segments of the butadiene-styrene rubber of the interpolymer, which penetrate into the butadiene-styrene rubber. The results of the tests for resistance of the connections by interpolymer adhesive films are shown in table 2.

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There are 9 figures, 2 tables, and 7 references, 3 of which are Soviet, 4 English.

69-20-1-7/20

Formation and Properties of Interpolymers of Natural and Butadiene Styrene Rubbers

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni M.V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov). Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry)

SUBMITTED: July 12, 1957

AVAILABLE: Library of Congress

Card 4/4

*DOGADKIN, B.A.*

AUTHOR: Dogadkin, B.A., Shershnev, V.A.

69-20-1-20/20

TITLE: The Action of Metallic Oxides in the Vulcanization of Rubber by Tetramethylthiuram Disulfide (Deystviye okislov metallov pri vulkanizatsii kauchuka tetrametiltiuramdisul'fidom)

PERIODICAL: Kolloidnyy Zhurnal, 1958, Vol XX, # 1, pp 124-127 (USSR)

ABSTRACT: In the article, the vulcanization of rubber at 143°C and 100 atm is investigated. The interaction of tetramethylthiuram disulfide with rubber under these conditions leads to its reduction of dimethylthiocarbamic acid, which, with zinc, becomes zinc dithiocarbamate. Figure 1 shows that in the process of vulcanization, part of the sulfur is separated again from the rubber. This separation is caused by the formation of volatile products. In the presence of zinc oxide, the formation of volatile products is considerably reduced. The stable zinc salt causes increased structuring and a fall in the effect of reversal of vulcanization.

Card 1/2 There are 4 figures, 1 table, and 6 references, 5 of which are Soviet, 1 German.

69-20-1-20/20

The Action of Metallic Oxides in the Vulcanization of Rubber by Tetra-  
methylthiuram Disulfide

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni  
M.V. Lomonosova (Moscow Institute of Fine Chemical Techno-  
logy imeni M.V. Lomonosov)

SUBMITTED: August 14, 1957

AVAILABLE: Library of Congress

Card 2/2

69-20-3-2/24

AUTHORS: Dogadkin, B.A.; Tarasova, Z.N.; Kaplunov, M.Ya.; Karpov, V.L.;  
Klauzen, N.A.

TITLE: The Structure and Properties of Rubbers Produced in Irradiation  
Vulcanization (Struktura i svoystva rezin, poluchennykh pri  
radiatsionnoy vulkanizatsii)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 260-271 (USSR)

ABSTRACT: The vulcanization of rubber products by different nuclear  
radiation sources has aroused great interest in the last  
years. The irradiated rubber products usually show better  
mechanical and chemical properties than those vulcanized by  
present methods. Rubbers of the types SKS-30A, SKI, SKB,  
and natural rubber were tested. The samples were irradiated  
in an atomic reactor or by a  $\text{Co}^{60}$  source with a dose of  
 $10^7$ - $10^8$  r. The investigation of the infrared absorption  
spectra has shown that in the  $5.8\mu$  field a broad absorption  
band corresponds to the carbonyl groups of acids, aldehydes,  
and ketones. In the  $2.8\mu$  field the absorption band of  
the hydroxyl groups is shown. The density of the network  
formed during irradiation vulcanization is determined by  
the energy dose absorbed, by the type and the composition

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69-20-3-2/24

The Structure and Properties of Rubbers Produced in Irradiation Vulcanization

of the rubber, carbon black and antioxidant, as well as by the irradiation conditions. The number of cross bonds per 100 eV in an air medium is, 12 in extracted butadienstirol rubber; 4 in extracted natural rubber; 2.5 in technical SKS-30A. The structurization effect is increased by an increase in temperature, and decreased in the presence of an inhibitor (phenyl- $\beta$ -naphthylamin). A correlation has been found between the relative rate of chemical stress relaxation and the density of the vulcanizate network which is due to the formation of C-C bonds during irradiation. The degree of crystallization in the rubber decreases when the irradiation doses are increased. At a dose of 20-30  $\cdot 10^6$  r the crystallization is the same as in sulfur vulcanizates of similar network density. Compared with sulfur vulcanizates, the irradiation samples show an aging resistance 4-5 times higher at 130°C, a lower residual deformation, a low hysteresis, a high temperature resistance, etc. There are 12 graphs, 6 tables, and 8 references, 5 of which are Soviet and 3 English.

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69-20-3-2/24

The Structure and Properties of Rubbers Produced in Irradiation Vulcanization

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti, Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: October 30, 1957

Card 3/3    1. Rubber—Vulcanisation    2. Rubber—Properties    3. Rubber  
—Radiation—Applications



69-20-3-3/24

AUTHORS: Dogadkin, B.A.; Skorodumova, Z.V.; Kovaleva, N.V.

TITLE: On the Chemical Interaction of Sulfur and Carbon Black (O khimicheskoy vzaimodeystvii sery s sazhem)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 272-278 (USSR)

ABSTRACT: The chemical interaction of sulfur and black is of great importance in the vulcanization of rubber. The quantity of chemically bound sulfur, when heated with black in a hydrocarbon medium, is the greater the less the oxygen content in the black. The removal of oxygen from the surface of the black by means of hydrogenization, etc increases the chemical absorption of the sulfur on the surface of the black. Heating of the black at temperatures higher than 900°C in a vacuum or hydrogen atmosphere leads to a decrease of the chemical absorption of sulfur on the surface of the black. This is due to the connection of the sulfur with the free valences of the end carbon atoms. An isotopic exchange of the bound sulfur with S<sup>35</sup> is not possible. It is assumed therefore that the sulfur on the surface of the black forms resistant monosulfide groups. In view of these facts it is supposed that the sulfur joins the carbon black mainly at

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On the Chemical Interaction of Sulfur and Carbon Black 69-20-3-3/24

the active sites of the carbon surface.

There are 5 tables, 7 graphs, and 7 references, 5 of which are Soviet, 1 English, and 1 German.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti, Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: February 20, 1958

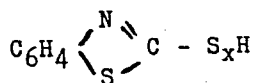
Card 2/2 1. Carbon black—Chemical reactions 2. Sulfur—Applications

AUTHORS: Dogadkin, B.A.; Tutorskiy, I.A. 69-20-3-4/24

TITLE: The Mechanism of Vulcanization in the Presence of 2-Mercapto-  
benzothiazole (Mekhanizm vulkanizatsii v prisutstvii 2-mer-  
kaptobenzotiazola)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 279-287 (USSR)

ABSTRACT: One of the most-widely used accelerators of vulcanization is  
mercaptobenzothiazole (MBT), named also kaptaks. The mecha-  
nism of its action has been studied in the article. In the  
interaction of MBT and sulfur in the temperature range  
140-180°C, H<sub>2</sub>S develops. The energy of the activation pro-  
cess is 33.5 kcal/mole. This value is so high that the men-  
tioned reaction cannot be regarded as the principal vulcani-  
zation reaction. One of the intermediate, formed in the  
vulcanization process is a polysulfide of the composition:



which has been extracted from the mixture by isotope exchange  
and identified by elementary analysis and spectroscopy.  
During heating in the press at vulcanization temperatures,  
MBT does not combine with the rubber. MBT reacts with rubber

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The Mechanism of Vulcanization in the Presence of 2-Mercaptobenzothiazole

only in the presence of sulfur during the vulcanization process. The activation energy of the addition of sulfur to natural rubber without an accelerator, and in the presence of MBT at the temperature range of 120-160°C, is 35.5 and 20.95 kcal/mole respectively. It is supposed that the mechanism of the accelerating action of MBT is determined by the formation of 2-thiobenzothiazolyl and persulfhydryl radicals. There are 14 graphs and 23 references, 15 of which are Soviet, 3 English, 2 American, 2 German, and 1 Czechoslovakian.

ASSOCIATION: Institut tonkoy khimicheskoy tekhnologii imeni M.V. Lomonosova  
(Institute of Fine Chemical Technology imeni M.V. Lomonosov)

SUBMITTED: March 2, 1958

Card 2/2

1. Vulcanization--Methods 2. 2-Mercaptobenzothiazole--Applications

69-20-3-5/24

AUTHORS: Fel'dshteyn, M.S.; Eytingon, I.I.; Pevzner, D.M.; Dogadkin, B.A.

TITLE: The Vulcanization Action of Some Heterocyclic Disulfides  
(Vulkanizuyushcheye deystviye nekotorykh geterotsiklicheskikh  
disul'fidov)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol. XX, Nr 3, pp 288-292 (USSR)

ABSTRACT: The organic di- and polysulfides are very important for the intensification of technological processes, because they act at the same time as accelerator and as independent vulcanization agents. In the article, heterocyclic disulfides which contain in the molecule  $>N-S-S-N<$  bonds are investigated. To these compounds belongs N,N'-dithiodimorpholine. Rubber vulcanized by this substance is resistant to the formation of cracks at frequent deformations with an increase of the corresponding index from 117.5 to 225 cycles, and is also resistant to aging due to the presence of resistant vulcanization bonds. The vulcanization by N,N'-dithiodimorpholine is accompanied by the joining of sulfur and nitrogen. The content of the bound sulfur, considerably surpasses the content of bound nitrogen. The vulcanizing action of the sub-

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69-20-3-5/24

The Vulcanization Action of Some Heterocyclic Disulfides

stance is regarded as a consequence of the asymmetrical decomposition of the compound into free radicals. There are 5 graphs and 5 references, 3 of which are Soviet and 2 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti, Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: January 23, 1958

Card 2/2

1. Disulfides—~~Heterocyclic~~—Vulcanization

69-20-3-6/24

AUTHORS: Sandomirskiy, D.M.; Margolina, Yu.L.; Dogadkin, B.A.; Krokhina, L.S.

TITLE: Ionic Deposition From Carboxylic Divinylstyrene Latexes  
(Ionnoye otlozheniye iz karboksilsoderzhashchikh divinil-stirol'nykh lateksov)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 293-297 (USSR)

ABSTRACT: The manufacture of rubber products immediately from latex by means of ion deposition is based on the interaction of the cations of the electrolyte diffused in the latex and the protective shell of the globules. The result of this interaction is the astabilization of the globules and the formation of a gel. Synthetic rubbers containing carboxyl groups in the molecule form very resistant vulcanizates. In the article, two carboxyl-containing divinylstyrene latexes are investigated with regard to ion deposition. It is shown that at an increase of the pH of the latexes from 4 - 10.1 the surface tension decreases from 54.2 - 40.1 dyn/cm. The change in viscosity is negligible in latexes containing 4 - 10% metacrylic acid. Graph 1 shows that an increase in the pH value causes a decrease in the speed of ion de-

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69-20-3-6/24

Ionic Deposition From Carboxylic Divinylstyrene Latexes

position. The increase of the pH also decreases the relative elongation and the ultimate swelling of the latex, but the tensile strength and the equilibrium modulus increase. In the process of ion deposition and the subsequent treatment of the films obtained, calcium chloride interacts not only with the protective substances of the latex globules but also with the carboxyl groups of the polymer molecules, which is the cause of the structurization. The calcium atoms may combine with two carboxyls in two different polymer molecules connecting them by stable chemical cross bonds.

There are 5 graphs, 2 tables, and 4 references, 2 of which are Soviet and 2 English:

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni Lomonosova (Moscow Institute of Fine Chemical Technology imeni Lomonosov). Nauchno-issledovatel'skiy institut rezinovykh i lateksnykh izdeliy, Moskva (Scientific Research Institute of Rubber and Latex Products, Moscow)

SUBMITTED:  
Card 2/2

1. Rubber products--Production 2. Latex--Applications 3. Ion  
--Deposits--Processes



69-20-3-23/24

AUTHORS: Dogadkin, B.A.; Gul', V.Ye.; Morozova, N.A.

TITLE: ~~The Effect of Electric Charges Formed During Repeated Deformations on the Fatigue Resistance of Vulcanizates~~ (O vliyani elektricheskikh zaryadov, voznikayushchikh v protsesse mnogokratnykh deformatsiy, na soprotivleniye utomleniyu vulkanizatorov)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 397-398 (USSR)

ABSTRACT: Electroelastic and friction-elastic effects cause electrical charges on deformed polymer products. The influence of these charges on the fatigue resistance of the vulcanizates has been studied in the article. Samples containing from 0-22 weight parts of carbon black did not conduct the electrical current of 127 v. A sample with 30 weight parts of carbon black broke after 215,000 test cycles, if the charges remained on it. If the charges were led off, the sample showed no change which could have been detected visually after 315,000 test cycles. The relative figures for 40 weight parts of carbon black are 23,000 cycles and 48,000 cycles; for 75 weight parts 8,000 and 20,000. The removal of the electrical charges, formed

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69-20-3-23/24

The Effect of Electric Charges Formed During Repeated Deformations of the  
Fatigue Resistance of Vulcanizates

during deformation of the polymer products, increases the  
fatigue resistance two times.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii (Moscow  
Institute of Fine Chemical Technology)

SUBMITTED: March 28, 1958

Card 2/2

1. Vulcanizates—Fatigue 2. Polymers—Deformation 3. Vulcanizates  
—Conductivity

AUTHORS: Dogadkin, B.A., Kuleznev, V.N. SOV-69-20-5-21/23

TITLE: The Formation of a Gel in the Plastication of Natural Rubber and Its Effect on the Strength of Vulcanizates (Obrazovaniye gelya pri plastikatsii natural'nogo kauchuka i yego vliyaniye na prochnost' vulkanizatorov).

PERIODICAL: Kolloidnyy zhurnal, 1958, Vol XX, Nr 5, pp 674-675 (USSR)

ABSTRACT: Gel formation has been observed during the plastication of natural rubber. In the early stages of plastication (10 min), a gel forms amounting to a maximum of 20%. Further rolling causes a mechanical dispersion of this gel fraction. If the argon atmosphere contains more than 0.1% oxygen, the free radicals are stabilized and no gel is formed. In the absence of oxygen, ramified molecules appear which decrease

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SOV-69-20-5-21/23

The Formation of a Gel in the Plastication of Natural Rubber and Its Effect on the Strength of Vulcanizates

the rupture resistance of the rubber to 20-40 kg/cm<sup>2</sup> in comparison to the usual values of 200-250 kg/cm<sup>2</sup>. There is 1 graph and 4 references, 1 of which is Soviet and 3 English.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M.V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov)

SUBMITTED: June 10, 1958

1. Gels--Development 2. Rubber--Processing 3. Vulcanizates  
--Mechanical properties

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DOGADKIN B.A.

AUTHOR: <sup>0.3</sup> Taubman, A.B.

SOV-69-20-5-23/23

TITLE: The Fourth All-Union Conference on Colloidal Chemistry (Chetvërtaya vsesoyuznaya konferentsiya po kolloidnoy khimii)

PERIODICAL: Kolloidnyy zhurnal, 1958, Vol XX, Nr 5, pp 677-679 (USSR)

ABSTRACT: The Fourth All-Union Conference on Colloidal Chemistry took place in Tbilisi from May 12-16, 1958. More than 150 papers were presented. A.V. Dumanskiy read a paper on the history of colloidal-chemical investigations in the USSR. The conference heard the following reports: V.A. Kargin, V.N. Tsvetkov, S.M. Lipatov, on polymers, their solutions and semi-colloids; A.I. Yurzhenko, P.M. Khomikovskiy, on the mechanism of emulsion polymerization; B.A. Dogadkin, on the production and the properties of the interpolymer of natural and butadienestyrene rubber; P.I. Zubov, on the mechanism of the formation of polymer films in gluing processes; S.S. Voyutskiy and D.M. Sandomirskiy, on colloid properties of latex systems; A.S. Kuz'minskiy and A.P. Pisarenko, on the properties of rubber and resin solutions; V.A. Pchelin, on the structural-mechanical properties of gelatine gels; N.A. Demchenko, on solubilization in soap solutions; A.V. Dumanskiy, on new methods for investigating the structures of

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The Fourth All-Union Conference on Colloidal Chemistry SOV-69-20-5-23/23

soaps and gels; P.A. Rebinder and his school on structure formation in solidification processes of binding materials; A.A. Trapeznikov, S.S. Voyutskiy, B.Ya. Yampol'skiy, G.V. Vinogradov, on problems of rheology and structure formation in oleophilic systems; L.A. Kozarovitskiy on the mechanism of the printing process and the influence of the rheological properties of printing dyes; I.N. Vlodavets, P.A. Rebinder on the process of structure formation in food stuffs; V.I. Likhtman, G.M. Bartenev, Ye.D. Shchukin, P.A. Rebinder, on deformation processes, the rheological conduct and the destruction of solids and metals; P.A. Tissen (GDR), on the surface dispersion of solid bodies; Linde (GDR), on the influence of surface layers on the kinetics of heterogeneous processes of diffusion exchange; M.Ye. Shishniashvili, M.P. Volarovich, N.N. Serb-Serbina, N.Ya. Denisov, Z.Ya. Berestneva, A.S. Korzhuyev, S.P. Nichiporenko, G.V. Kukoleva, F.D. Ovcharenko, I.N. Antipov-Karatayev, on structure formation in the colloidal chemistry of clays and peat; B.V. Deryagin, on the interaction of twisted metal threads in solutions of electrolytes; A.D. Sheludko, M.B. Radvinskiy, on the resistance of free films and foams; S.V. Nerpin, on the hydromechanics and thermodynamics of thin films and their influence on soil properties; S.Yu. Yelovich, on catalytic processes

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SOV-69-20-5-23/23

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in foams; Yu. M. Glazman, on the first mathematical theory of ion antagonism; O.N. Grigorov, D.A. Fridrikhsberg, S.G. Teletov, on the electrokinetic properties of colloids in connection with their coagulation by electrolytes; Ye.M. Napobashvili on radiation colloidal chemistry; B.A. Dogadkin, on the chemical sorption of sulfur and rubber on carbon black; S.G. Mokrushin, on the formation of thin colloidal films, N.A. Krotova, on the influence of an electrical field on the dispersion of a liquid; E.M. Natanson, V.G. Levich, L.Ya. Kremnev, A.B. Taubman, on the resistance of emulsions and suspensions in connection with the stabilizing action of structure-mechanical properties of protective surface layers; P.S. Prokhorov, B.V. Deryagin, G.I. Izmaylova, S.S. Dukhin, on the adsorption of vapors by condensation nuclei and their influence on the formation of water aerosols; P.I. Kaishev, O.M. Todes, on the kinetics of formation and destruction of aerosols; A.B. Taubman, on the kinetic wetting in the process of collecting dust by use

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SOV-69-20-5-23/23

The Fourth All-Union Conference on Colloidal Chemistry

of solutions of surface-active substances; A.N. Frumkin, M.M. Dubinin, B.P. Bering, V.V. Serpinskiy, V.M. Luk'yanovich, L.V. Radushkevich, G.V. Tsitsishvili, N.F. Yermolenko, on the adsorption from vapors and liquids.

1. Chemistry--USSR 2. Colloids--Chemical properties

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USCCOM-DC-55808



DOGADKIN, B.; PECHKOVSKAYA, K.; GOL'DMAN, M.

Structure and the reinforcing effect of colloidal silica as a filler  
for synthetic rubber. Dokl. AN SSSR 119 no.6:1170-1173 Ap '58.  
(MIRA 11:6)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.  
Predstavleno akademikom P.A. Rebinderom.

(Silica) (Rubber, Synthetic)

SOV/138-58-9-3/11

AUTHORS: ~~Dogadkin, B. A.~~; Fel'dshteyn, M. S; Eyttinger, I. I. and Pevzner, D. M.

TITLE: Action of Some Heterocyclic Disulphides as Vulcanisation Agents and Accelerators (O deystvii nekotorykh geterotsiklicheskiikh disul'fidov, kak agentov i uskoriteley vulkanizatsii)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 9, pp 7 - 12 (USSR)

ABSTRACT: Experiments were carried out on the action of heterocyclic disulphides containing in the molecule >N-S-S-N< bonds, especially N,N'-dithiodimorpholine (DTM). This compound was obtained by reacting morpholin with sulphur dichloride in a dichlorethane solution at 2 - 4°C in the presence of alkali. Pure DTM was obtained after distillation and subsequent crystallisation. A percentage analysis of the product is given. The vulcanisation activity of DTM was investigated in butadiene-styrene rubber SKS-30A, with or without the addition of fillers, but which did not contain S. 7.4% of DTM was added to the rubber. The vulcanisation kinetics of a mixture containing sulphur was defined at the same time. Data on the kinetics of sulphur addition to the rubber at a vulcanisation temperature of 143°C is given

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SOV/138-58-9-3/11  
Action of Some Heterocyclic Disulphides as Vulcanisation Agents and Accelerators

in a graph (Fig.1). Fig.2: kinetics of changes in the rate of swelling of mixtures containing N,N'-dithiodimorpholine (1) DTM, N,N'-dithiodipiperidine (2) DTP and sulphur (3). When sulphur is used as vulcanisation agent for 120 minutes, no normal vulcanisates are formed. When DTM is used as vulcanising agent good results are obtained after 45 minutes (Fig.3). The effect of DTM on mixtures containing sulphur is graphically shown in Fig.4A. The vulcanising activity of DTM increases sharply when small quantities of mercaptobenzothiazole MBT or of sulphonamide BT are added. Vulcanisation systems containing DTM and dibenzothiazole disulphide (DBTD), but without sulphur, can be vulcanised in 40 - 50 minutes at 138°C; these optimum conditions are the same as for vulcanisates prepared by using sulphonamide and considerable quantities of sulphur (Fig.4B). Fig.5: Variations in the plasticity (according to Mooney) in mixtures containing DTM and sulphonamide BT. Values on swelling in xylene and solubility in chloroform after heating for 60 minutes at 100, 110, 120 and 130°C are given (Table 1). The

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Action of Some Heterocyclic Disulphides as Vulcanisation Agents and Accelerators

addition of DTM influences the resistance of the vulcanisates during repeated deformations (Fig.6). These experiments show conclusively that DTM improves considerably the properties of the vulcanisates. The kinetics of the addition of S and N, when using DTM and DTP, are discussed and shown in 2 graphs (Figs. 7 and 8). There are 8 Figures, 1 Table and 8 References: 2 English, 5 Soviet and 1 German.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific-Research Institute of the Tyre Industry)

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SOV/138-58-9-5/11

AUTHORS: Gul', V. Ye; Fedynin, D. L; ~~Dogadkin, B. A.~~

- TITLE: The Effect of Changing the Intermolecular Interaction on the Dynamic Fatigue of Rubbers (Vliyaniye izmeneniya mezhmolekulyarnogo vzaimodeystviya na dinamicheskuyu ustalost' rezin)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 9, pp 16 - 20 (USSR)

ABSTRACT: The physical and mechanical properties of vulcanisates depend to a considerable degree on the rate of the intermolecular interaction. Therefore, a change in the character and rate of the interaction will cause a corresponding alteration in the mechanical properties of the vulcanisates. Deformation is accompanied by disruption of localised intermolecular bonds. A certain amount of heat is, therefore, created during the deformation process (Ref.9 and 10). The disruption of secondary links causes hysteresis, relaxation and formation of heat. This formed heat intensifies the chemical reactions occurring in the vulcanisates. A change in the structure can be observed during periodic deformation. These changes depend on its conditions and on the chemical reactions such as oxidation, polymerisation, etc. Tests were carried out on natural

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SOV/138-58-9-5/11

## The Effect of Changing the Intermolecular Interaction on the Dynamic Fatigue of Rubbers

butadiene-styrene (ratio of the butadiene/styrene equalled 70:30), butadiene-nitrile (ratio of butadiene/acrylonitrile equalled 60:40; 74:26 and 82:18). Dimethylphthalate (DMF), dibutylphthalate (DBF), dioctylphthalate (DOF), dibutylsebacate (DBS), dioctylsebacate (DOS) and vaseline oil (BN) were used as solvents for the vulcanisates. The vulcanisates were subjected to swelling, the degree of which is expressed in percentage. The fatigue resistance was investigated under conditions of constant final amplitudes of deformation (Ref.2 and Fig.1). Tests were carried out at room temperature and a frequency of 254 cycles/minute. A typical strength/deformation curve for a filled vulcanisate based on SKN-40 is given in Fig.2. These experiments were carried out on the machine Metalist MRS-2. Figs.3 - 5: changes in the fatigue resistance of filled vulcanisates of natural rubber, SKS-30 and SKN-40 when using the various solvents. A decreasing rate of the intermolecular interaction during

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SOV/138-58-9-5/11

The Effect of Changing the Intermolecular Interaction on the Dynamic  
Fatigue of Rubbers

swelling is proved by the changes in the coefficient of mechanical losses during swelling and at the glass temperature (Fig.6). These experiments prove that the changes in the residual resistance of vulcanisates during swelling in low-molecular solvents depend not only on the degree of swelling, but also on the characteristics of the solvent and the rubber. Changes in the fatigue resistance of non-filled SKN vulcanisates, depending on the concentration of acrylonitrile, are given in Fig.7; the dependence of the fatigue resistance of filled SKS-30 vulcanisates on the quantity of DMF-1, DOF-2x, VM-3 and DOS-4: Fig.8. When carrying out tests on thin samples, the temperature of the sample itself does practically not depend on the molecular interaction, and is approximately the same as the temperature of the surrounding medium. It can be assumed that solvents causing the sharpest decrease in the fatigue resistance during swelling of small articles should be responsible for the greatest increase of the fatigue resistance in larger samples. From results shown in Figs. 8 and 8a it can be seen that the fatigue resistance falls pro-

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The Effect of Changing the Intermolecular Interaction on the Dynamic Fatigue of Rubbers

portionately with increase in the dosage of the plasticiser. The optimum composition of mixtures of the material can be defined by investigating the physical action of plasticisers and analysing their effect on the swelling of the vulcanisates. In this way the more important properties of vulcanisates, such as fatigue resistance, mechanical losses and frost resistance, can be improved by using solvents (plasticisers) containing characteristic functional groups. There are 10 Figures and 13 References: 11 Soviet and 2 English.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (The Moscow Institute for Fine Chemical Technology im. M. V. Lomonosov)

Card 4/4



**AUTHOR:** Dogadkin, B. A. SOV/138-58-11-3/14

**TITLE:** Vulcanisation Systems for Tyre Rubbers (Vulkanizuyushohiye sistemy dlya shinnykh rezin)

**PERIODICAL:** Kauchuk i Rezina, 1958, Nr 11 pp 6 - 11 (USSR)

**ABSTRACT:** This lecture was read at the meeting for the coordination of research work in the field of increasing the properties of tyres, Moscow, November 1957. This work is based on experimental data obtained by the author and M. S. Fel'dshteyn, Z. N. Tarasovaya, I. I. Eytingon, O. N. Belyatskaya, V. A. Shershnevly, V. V. Selyukovey and E. N. Belyayevaya. The physical, chemical, and mechanical characteristics of tyres and of laminated articles can be increased by applying special vulcanisation systems. These should have the following characteristics: (a) a special type of vulcanisation when during the induction period sulphur is added at a low rate; (b) the possibility of forming vulcanisation structures which are resistant to oxidation and thermo-mechanical effects during repeated deformations; (c) to safeguard the basic physico-mechanical properties when increasing the vulcanisation temperature and (d) to effect covulcanisation of rubbers which are based on various types of resins. All the

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## Vulcanisation Systems for Tyre Rubbers

SOV/138-58-11-3/14

aforementioned characteristics of vulcanisation systems depend on the type of rubber, on the composition of the vulcanisation group and on the type of accelerator. Sulphonamide derivatives of mercaptobenzothiazole are satisfactory vulcanisation accelerators for butadiene-styrene rubbers. It was found that the kinetics of vulcanisation with sulphonamide accelerators (sulphonamide BT or Santocure) are defined by S-type curves with a well-defined initial period when sulphur is added at a slow rate (Fig.1). The dynamics of changes of the equilibrium modulus (Fig.2) or the maximum of swelling is indirectly characterised by the induction period of vulcanisation. Twelve different accelerators with various substituents at amino-nitrogen were prepared. The length of the induction period depends on such factors as the temperature, the concentration of sulphur and on the accelerator. One part of the sulphonamide is added to the rubber during the vulcanisation process. The second part is reduced to the mercaptan and amine (Fig.3). Polymer radicals are formed after the hydrogen has been split off; these radicals form -C-C- links. The mercaptobenzothiazole formed by reduction of the sulphonamide influences the vulcanisation. The curve of the free

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Vulcanisation Systems for Tyre Rubbers

SOV/138-58-11-3/14

mercaptan shows a maximum which coincides with the maximum rate of vulcanisation (Fig.3). At this moment an optimum concentration of the two accelerators (captax and amines) is observed in the vulcanisation mixture. Their simultaneous action is greater than the additive action of the accelerators of the same concentrations (Fig.4). The energy of activation for the addition reaction of sulphur during the induction period in mixtures of sodium-butadiene rubber and sulphonamide BT is approximately 30 kcal/mol. which is approximately equal to the activation energy during the vulcanisation of mixtures which do not contain accelerators. Due to the initial slow rate of addition of sulphur in the mixtures the substances maintain their viscosity for a considerable time (Fig.5). The mercaptobenzothiazole activates the thermo-oxidation and thermal destruction of the rubbers. Analogous properties can be observed in some secondary amines, particularly phenylhydrazine and phenyl- $\beta$ -naphthylamine. Experiments were carried out when using tetramethylthiuram disulphide during the vulcanisation process (Fig.6). The mercaptans

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Vulcanisation Systems for Tyre Rubbers SOV/138-58-11-3/14

and secondary amines also cause reversion of the vulcanisation. When the vulcanisation temperature increases the maximum swelling also increases, and static strength of the unfilled vulcanisates decreases (Fig.7). Mixtures containing fillers show only small changes on increasing the temperature (Figs. 8 and 9). The reversion of vulcanisation can be inhibited at high temperatures (160 - 170°C) by using sulphonamides, together with such accelerators which cause a bonding of the amines. For instance, sulphonamide BT and thiuram monodisulphide (Fig.10). Urotropine can also be added (Fig.11). Satisfactory results were obtained with a mixture of Santocure and diphenylguanidine when vulcanising oily butadiene-styrene rubber at temperatures up to 175°C (Fig.12). Di- and poly-sulphides (for instance di- and poly-sulphides of morpholine) are used as accelerators and vulcanisation agents: fig.13. No scorching could be observed at temperatures of 110°C when using this compound (Fig.14). The stable vulcanisation links ensure a high degree of strength of the bonds and good fatigue resistance of the vulcanisates. Difficulties due to covulcanising between the layers of the casing arise when the laminate

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consists of various types of rubber. In the case of compatible rubbers, which have various concentration and differing activity of the double bonds, co-vulcanisation produces such composition of vulcanisation groups which secures synchronisation of the vulcanisation process in both layers. Experiments with compatible and non-compatible rubbers were carried out by cold plasticisation in an inert gas atmosphere on inter-polymers of butadiene-styrene and natural rubbers. There are 14 Figures,

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Country : Czechoslovakia H-31  
Category :  
Abs. Jour. : 43014  
Author : Beniska, J.; Dogadkin, B.  
Institut. :  
Title : Effects of Activators on Vulcanization Process.  
II. Effect of Zinc Oxide on Structure of the  
Vulcanizates.  
Orig. Pub. : Chem. zvesti, 1958, 12, No 6, 376-381

Abstract : Study of the effect of ZnO and stearic acid (I) on structure of SKB-vulcanizates of mercaptobenzothiazole containing mixes, as determined on the basis of swelling kinetics data. ZnO in the presence of I affects substantially the rate and extent of cross-linking of rubber: activates linking of rubber molecules by sulfur bi-radicals, which results in the formation, primarily, of polysulfide bonds, and an oxidation of sulfhydryl groups of the rubber, which leads to the formation of mono-, di-, and polysulfide bonds, as a result of which new cross-linkages are formed containing fewer S-atoms. Communication I see RZhKhim, 1959, No 5, 17728. -- According to the authors' summary.



DOGADKIN, B.A.; SHERSHNEV, V.A.

Reaction of tetramethylthiuram disulfide with rubber and with  
compounds containing a labile hydrogen atom. Vysokom.soed. 1  
no.1:58-67 Ja '59. (MIRA 12:9)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M.V.  
Lomonosova.

(Disulfide) (Rubber)



DOGADKIN, B.A.; BELYAYEVA, B.N.

Reaction of phenyl- $\beta$ -naphthylamine with benzoyl peroxide and the effect of O-benzoyl-N-phenyl-N- $\beta$ -naphthylhydroxylamine on the oxidation of rubber. Vysokom.sosed. 1 no.1:123-125 Ja '59.  
(MIRA 12:9)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.  
(Antioxidants) (Naphthylamine) (Benzoyl peroxide)

DOGADKIN, B.A.; FEL'DSHTEYN, M.S.; BELYAYEVA, E.N.

Effect of double systems of vulcanization accelerators. Vysokom  
soed. 1 no.2:254-264 F '59. (MIRA 12:10)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti,  
Moskva.  
(Vulcanization)

~~DOGADKIN, B.A.~~; BELYAYEVA, E.N.

Role of free radicals in the low temperature vulcanization  
(formation of structure) of rubber. Vysokom.soad. 1 no.2:  
315-323 F '59. (MIRA 12:10)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.  
(Rubber) - (Radicals (Chemistry)) (Vulcanization)

DOGADKIN, B.A.; BELYATSKAYA, O.N.; DOBROMYSLOVA, A.V.; FEL'DSHTEYN, M.S.

Vulcanization of rubber in the presence of N,N-diethyl-2-benzothiazylsulfenamide as accelerator. Vysokom. soed. 1 no.6:878-888 Je '59.  
(MIRA 12:10)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii im. Lomonosova.  
(Vulcanization)

TUTORSKIY, I.A.; SMELYY, Z.; DOGADKIN, B.A.

Interaction between carborylated rubber and  $\epsilon$ -caprolactam.  
Vysokom.soed. 1 no.11:1652-1654 N '59. (MIRA 13:5)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni  
M.V. Lomonosova.

(Rubber)

(Hexamethylenimine)

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SOV/69-21-2-9/22

AUTHORS: Dogadkin, B.A., Kuleznev, V.N., Pryakhina, S.F.

TITLE: On the Compatibility of Polymers in Solution (K voprosu o sovместимости полимеров в растворе)

PERIODICAL: Kolloidnyy zhurnal, 1959, Nr 2, pp 174-180 (USSR)

ABSTRACT: This is a report on an investigation concerning the behaviour of mixtures of natural and butadiene styrene rubber in a common solution. The experiments have shown that mixtures of 5% benzene solutions of natural and butadiene styrene rubber exfoliate, if these substances are mixed within the limits 1:9 and 9:1. The concentration of the laminae is not equal to the initial concentration. For any ratio of rubber mixtures, the experimental viscosity values are higher, whereas the turbidity of the solutions is lower than the additive magnitudes. The increase in temperature, or the introduction of large quantities of methyl ethyl ketone bring together the experimental and additive values of the viscosity of the solutions, i.e. they increase the compatibility of natural and butadiene

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SOV/69-21-2-9/22

On the Compatibility of Polymers in Solution

styrene rubber. The presence of an interpolymer in a natural and butadiene styrene rubber mixture prevents exfoliation of the solution. According to the authors the observed phenomena may be considered as the result of molecular associations of prevalently homogeneous composition. There are 5 graphs and 10 references, 6 of which are Soviet and 4 English.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im.M.V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov)

SUBMITTED: May 9, 1958

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5(4)

SOV/69-21-2-20/22

AUTHORS: Dogadkin, B.A., Shershnev, V.A.

TITLE: On the Interaction of Tetramethylthiuram Disulfide and Tetramethylthiuram Monosulfide With Rubber (O vzaimodeystvii tetrametiltiuramdisul'fida i tetrametiltiurammonosul'fida s kauchukom)

PERIODICAL: Kolloidnyy zhurnal, 1959, Nr 2, pp 244-245 (USSR)

ABSTRACT: In order to clarify the character of interaction between rubber and tetramethylthiuram disulfide (TMTD) and tetramethylthiuram monosulfide (TMTM), the authors investigated electronic paramagnetic resonance spectra during the heating process of mixtures of rubber with TMTD and TMTM. The mixtures were prepared on micro-rolls in an argon medium and plated into quartz ampules, which were heated immediately in the resonator (in argon, vacuum or air). At the heating of all mixtures (140%), unique spectra appeared (see graph 2), the least intensive in the mixture with TMTM. This shows that the interaction mechanism of TMTD and TMTM with rubber, probably is common, whereas the kinetic

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On the Interaction of Tetramethylthiuram Disulfide and Tetramethylthiuram Monosulfide With Rubber.

characteristics differ considerably. This is proved by the reaction of TMTD and TMTM with geraniol, which can be considered as a model of the structural units of natural rubber. At the heating of the mixtures TMTD and TMTM with geraniol, and also at their treatment with ultraviolet rays in a quartz ampule at room temperature, they acquire a unique red-orange coloring, the intensity of which increases more slowly in mixtures with TMTM. The facts set forth by the author permit the conclusion, that TMTM and TMTD interact with rubber through a stage of free radicals, and disintegrate according to the bonds C - S and S - S. There are 2 graphs and 7 references, 2 of which are Soviet, 3 German and 2 English.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M.V. Lomonosova (Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov)

SUBMITTED: September 3, 1958

Card 2/2

SOV/138-59-4-8/26

AUTHORS: Drozdovskiy, V.F., Sokolov, S.A. and Dogadkin, B.A.

TITLE: The Effect of Sulphur-Containing Derivatives of Carbazole on the Regeneration of Rubbers (Sliyaniye serosoderzhashchikh proizvodnykh karbazola na protsess regeneratsii rezin )

PERIODICAL: Kauchuk i Rezina, 1959, Nr 4, pp 29-31 (USSR)

ABSTRACT: The addition of small quantities of activators shortens the time of regeneration of rubbers and also makes it possible to use smaller quantities of plasticizers. Various sulphur-containing compounds such as mercaptans, zinc salts of mercaptans and alkyl phenol sulphides are used as activators during the regeneration of natural and synthetic rubber vulcanisates. The Polish patent specification 35298 (1953) (Ref 6) mentions the use of a mixture of mercapto-anthracene and mercapto-carbazole. The effect of these compounds on the process of regeneration and on the vulcanization process of a mixture of SKB and NK rubbers was investigated. The rubbers were regenerated by heating them for five hours at 180°C and tested according to the standard for regenerated tyre rubbers GOST 3550-54. During the test the product obtained

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The Effect of Sulphur-Containing Derivatives of Carbazole on the Regeneration of Rubbers

by interacting carbazole with sulphur monochloride and morpholine disulphide was used (Table 1). Literature data (Ref 7) indicate that morpholine disulphide itself acts as vulcanizing agent and also as a vulcanization accelerator. Experiments were carried out to test the effect of the product obtained by the interaction of carbazole and sulphur monochloride on the vulcanization process of natural rubber at 143°C. Results indicated that this product also acts as vulcanizing agent and vulcanizing accelerator, but is less effective than morpholine disulphide. 3-mercapto carbazole was prepared according to data given earlier (Ref 8) and its effect compared with that of "Renatsit" II (Table 2). Results showed that 3-mercapto carbazole is more active than trichlorothiophenol ("Renatsit" II). The activity of 3-thiocyanate carbazole and x,3-dithiocyanate carbazole was also tested (Table 3),

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The Effect of Sulphur-Containing Derivatives of Carbazole on the  
Regeneration of Rubbers

and it was shown that purified 3-thiocyanate carbazole was equally effective as "Renatsit" II. The x,3-dirhodanate carbazole, however, was unsatisfactory. (Table 4). The authors concluded that the 3-mercapto carbazole and 3-rhodanate carbazole are satisfactory compounds to be used during the regeneration of rubbers, and their action is analogous to that of mercaptans. There are 4 tables and 10 references, 8 of which are English, 1 Soviet and 1 Polish.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Tyre Industry Research Institute)

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15(9)

SOV/63-4-1-8/31

AUTHOR: Dogadkin, B.A., Professor

TITLE: Vulcanization Structures and Their Change During Vulcanization, Thermomechanical Treatment and Fatigue of Vulcanizates (Vulkanizatsionnyye struktury i ikh izmeneniye pri vulkanizatsii, termomekhanicheskom vozdeystvii i utomlenii vulkanizatorov).

PERIODICAL: Khimicheskaya nauka i promyshlennost', 1959, Vol 4, Nr 1, pp 55-62 (USSR)

ABSTRACT: During vulcanization chemical cross bonds are formed between the molecular chains of the rubber. The type, concentration and distribution of these bonds is designated here by "vulcanization structure". A change in these structures is one of the causes of aging and fatigue of the rubber. The cross bonds are of the type -C-C- and -C-S<sub>x</sub>-C-. The interaction of polymer radicals between themselves and with the rubber molecules leads to the formation of -C-C- bonds. The interaction of sulfur bi-radicals S<sub>x</sub>, sulfhydryl radicals HS and persulfhydryl radicals HS<sub>x</sub> produces -C-S<sub>x</sub>-C- bonds. The exchange of the elementary sulfur with the vulcanizate takes place by the radical mechanism. This is affirmed by the fact that diphenylpicrylhydrazyl reduces the rate and the degree of the exchange (Figure 3). For the in-

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Investigation of the structure of the sulfur bonds in the vulcanizate sulfur isotopes were used. A relation has been found between the rate of the isotope exchange and the stress relaxation of vulcanizates with various accelerators. The high thermomechanical resistance of -C-C- bonds has been proved on samples obtained by means of a 20,000-Cu cobalt source. The stress relaxation of these samples proceeds at a constant rate (Figure 5), whereas sulfur vulcanizates show an exponential dependence. During vulcanization first the polysulfide groups unite with the rubber. Later they decompose and form bonds with a smaller number of sulfur atoms. Zinc oxide has practically no effect on the kinetics of the sulfur-rubber connection, but increases the number of the cross bonds in the vulcanizate. Activators, like ZnO, reduce the number of sulfur atoms per bond which is proved by the lower exchange ability of such vulcanizates. Amines and mercaptanes in the presence of oxygen interact with polysulfides causing their decomposition. This lowers the quality of the rubber by reversing the vulcanization. The operation properties of vulcanizates depend on the energy of

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Vulcanization Structures and Their Change During Vulcanization, Thermomechanical Treatment and Fatigue of Vulcanizates

vulcanization bonds. In samples with tetramethylthiuramdisulfide which contain  $-C-C-$  and  $-C-S_x-C-$  bonds the energy is 60 - 50 kcal/mole. Their operating properties are better than those containing sulfur and diphenylguanidine with a great many  $-C-S_x-C-$  bonds and an energy of only 27 kcal/mole. Fatigue of butadiene-styrene rubber is accompanied by an increase of the isotope exchange due to a decrease of the number of cross bonds between the rubber chains. The effect of antifatigue agents and antioxidants is determined not only by thermodynamic and kinetic conditions, but also by topochemical factors affecting the direction of the secondary processes of the changes in the vulcanization structures. There are 15 graphs, 3 tables and 15 references, 9 of which are Soviet, 5 English, and 1 German.

(-17 5/3)

15 (7), 15 (9)

AUTHORS: Dogadkin, B. A., Sandomirskiy, D. M., SOV/64-59-5-8/28  
Rasshivalina, K. I., Geller, T. I.

TITLE: Production and Properties of a Varnish for Rubber Shoes by  
Oxidation of Sodium Butadiene Rubber in Solution

PERIODICAL: Khimicheskaya promyshlennost', 1959, Nr 5, pp 398 - 401 (USSR)

ABSTRACT: A. I. Tsvetkov, S. I. Khodosh, and O. V. Baksht participated in the development of the process. In the oxidation of polybutadiene rubber or a vulcanizate of sodium butadiene rubber an oxidation product may be obtained which is utilized as a film former or serves for the manufacture of adhesive substances. Oxidation experiments were carried out with sodium butadiene rubber solutions in white spirit in order to obtain a varnish for rubber shoes on this basis. The oxidation experiments were made during a continuous passage of air through the solution. A temperature of 120° proved to be most suitable when using 11-12% solutions. The course of the process was determined as to the viscosity of the solution (Figs 3,4). Since a temperature increase does not only accelerate the destruction but also the structure formation, various substances such as ferric oleate, or ferric stearate, 2% captax + 5% benzoic acid, as well

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as pure benzoic acid, polyphenols, RPA-2, "renatsite", etc, were investigated. The most effective substances were the two iron salts (3.5 parts by weight/100 parts by weight (sodium butadiene rubber)) with the aid of which the desired consistency of the 12% solution of 16 centipoises in 8 hours at 100° (instead of within 15-16 hours at 120°) was attained, thus forming considerably less peroxide groups and volatile acids. 40 l/hour per 1 kg of solution was found as the optimum air supply velocity (at 100-120°) (Fig 5). Experiments with iron isotopes showed that in the oxidation iron is linked completely to sodium butadiene rubber, i.e. it does not only act as oxygen carrier (which needs further experiments). The influence exerted by the oxidation period on the properties of the finished varnish film (Fig 6, diagrams) was investigated. The best results were obtained from a varnish to which ferric stearate, 2% sulphur, and 2% thiuram (or 4% butyl cymate or 2% carbon-black) were added since said varnish dries at 100° in 30 minutes (and at 70° in 50 minutes with butyl cymate or carbonblack) and exhibits a correspondingly good adhesion on rubber shoes. On

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the basis of the results obtained in the zavod "Krasnyy Bogatyr"  
("Krasnyy Bogatyr" Plant) a suitable plant was designed for the prod-  
uction of a varnish for noncured rubber shoes (Fig 8). A de-  
scription of the plant is given. There are 8 figures and 6  
Soviet references.

Card 3/3

FEL'DSHTEYN M.S.; EYTINGON, I.I.; PEVNER, D.M.; STREL'NIKOVA, N.P.;  
DOGADKIN, B.A.

Study of a series of derivatives of-mercaptobenzothiazole and  
dimethyldithiocarbamic acid as vulcanization accelerators. Kauch.  
i rez. 18 no.1:16-21 Ja '59. (MIRA 12:1)

1.Nauchno-issledovatel'skiy institut shinney promyshlennosti.  
(Vulcanization) (Benzothiazole) (Carbamic acid)

SOV/138-59-2-6/24

AUTHORS: Gul', B. Ye., Dogadkin, B. A. and Van Man'-sya

TITLE: Investigation of the Effect of Fillers on the  
Distribution of Deformation in a Vulcanisate Sample  
Subjected to Rupture Tests (Issledovaniye vliyaniya  
napolniteley na raspredeleniye deformatsiy v  
razryvayushchemsya obraztse vulkanizata)

PERIODICAL: Kauchuk i rezina, 1959, <sup>18</sup>Nr 2, pp 17-20 (USSR)

ABSTRACT: The Elastomer Laboratory of MITKhT imeni M.V.Lomonosov developed recently a high-speed photographic method, used during rupture tests for vulcanisates (Refs 4-6) which makes possible a direct observation of the distribution of deformations in filled and unfilled vulcanisates. The effect of active and inactive carbon blacks on deformation properties of vulcanisates during rupture processes was investigated. Vulcanisates of non-crystallising sodium butadiene rubber were tested, the composition of which is given. A large number of high-speed photographs were taken of vulcanisates which contained different quantities of carbon blacks. The rate of rupture was found to be small at first but

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increased in stages up to the breaking point. Average rates of rupture were calculated and the dependence of these on the concentration of carbon black in the vulcanisate is given (Fig 1). It can be seen that different curves were obtained for channel black and for various types of carbon black. Filled vulcanisates show an unequal distribution of deformation in the sample (Ref 6). During equal stretching additional elongation of a sample was observed in the place of rupture. This deformation should be accompanied by an orientation of the material in the place of rupture and the authors determined the degree of this orientation (Fig 2). The influence of the degree of filling, also of the filler itself, on the deformation curves was investigated (Fig 3). The rupture of vulcanisates is characterized by an increase in the time of rupture when increasing the concentration of channel black up to 40 parts weight to 100 parts weight of rubber (Fig 4). A further addition of channel black causes a decrease in the time of rupture. Figs 5 and 6 show the physico-mechanical

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SOV/138-59-2-6/24

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properties of vulcanisates as a function of filling with channel and channel black. The modulus of elasticity of the vulcanisates increases uniformly with increasing concentration of carbon black. Unfilled vulcanisates show an unequal distribution of tension. This applies also to filled vulcanisates but in these the distribution of tension is slightly more equal. The maximum values of additional orientation in the place of rupture are relatively small for unfilled vulcanisates as well as for those containing carbon black. It is suggested that the interaction between the carbon black particles and the molecules of rubber in the vulcanisates is small; this is confirmed by the small losses in hysteresis. The relaxation properties of vulcanisates are more satisfactory when active channel black is used as filler. This is explained by an increase in the tension which exists up to the point of rupture. Micro-photographs were taken with the aid of a micro-film unit MKU-1. The samples were subjected to deformation up to

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SOV/138-59-2-6/24  
Investigation of the Effect of Fillers on the Distribution of  
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800% elongation. Fig 7 shows the dependence of the degree of additional micro-orientation on the duration of deformation of the filled vulcanisate. It is concluded that a minimum average rate of rupture occurs when channel black is used as filler. The formation of carbon black structure in the rubber is closely connected with the degree of additional orientation of the material in the place of rupture. Investigations on the increase of additional orientation during the rupture process in filled vulcanisate confirmed the conclusions which were based on the analysis of high-speed photographs taken during the rupture of filled vulcanisates. There are 7 figures and 7 Soviet references.

ASSOCIATION: Moskovskiy institut tonkoy khimicheskoy tekhnologii  
im. M. V. Lomonosova (Moscow Institute for Fine Chemical  
Technology imeni M. V. Lomonosov)

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5(4)

SOV/69-21-4-10/22

AUTHOR: Dogadkin, B.A., Eytingon, I.I., Fel'dshteyn, M.S., Tarasova Z.N.,  
Gur'yanova, Ye .N., Lin Yang Ch'ih, Klausen, N.A. and Pevzner,  
D.M.

TITLE: Vulcanization of Rubber in the Presence of Aminomethyl Deri-  
vatives of 2-Mercaptobenzothiazole

PERIODICAL: Kolloidnyy zhurnal, 1959, Vol XXI, Nr 4, pp 427-435 (USSR)

ABSTRACT: The authors synthesized a number of compounds, condensation  
products of 2-mercaptobenzothiazole and formaldehyde with various  
amines, to test them as accelerators of vulcanization in mix-  
tures of synthetic and natural rubbers. According to the data  
of spectral analysis, the chemical structure of these 2-mercap-  
tobenzothiazole derivatives is characterized by the presence  
of a -S-C-N- group. The experiments proved that aminomethyl  
derivatives of 2-mercaptobenzothiazole are effective accelera-  
tors of the vulcanization process. Figure 3 (graph) shows the  
vulcanizing activity of these derivatives in comparison with

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SOV/69-21-4-10/22

Vulcanization of Rubber in the Presence of Aminomethyl Derivatives of  
2- Mercaptobenzothiazole

the effect of sulfenamide accelerators. It was further found that vulcanization of rubber mixtures with aminomethyl derivatives is characterized by higher rates in the initial period as compared with vulcanization of mixtures containing sulfenamide accelerators. In comparison with the latter, aminomethyl derivatives enter into isotopic exchange with di-2-benzothiazolil-disulfide at lower temperatures (graphs 6 and 7). Aminomethyl derivatives of 2-mercaptobenzothiazole do not exert an independent structurizing (vulcanizing) effect on rubber (table 3). In this respect they differ from the sulfenamide compounds. There are 7 graphs, 3 tables and 7 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti,  
Moskva (Scientific Research Institute of the Tire Industry,  
Moscow)

SUBMITTED: 23 December, 1958  
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5(3), 15(9)

SOV/80-32-4-34/47

AUTHORS: Fel'dshteyn, M.S., Dogadkin, B.A., Eytngon, I.I., Shcherbachev, G.P. and Strel'nikova, N.P.

TITLE: On the Problem of the Effect of the Chemical Structure of Sulfenamide Compounds on Vulcanization Activity (K voprosu o vliyanii khimicheskoy struktury sul'fenamidnykh soyedineniy na vulkanizatsionnuyu aktivnost')

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Vol 32, Nr 4, pp 893-901 (USSR)

ABSTRACT: The authors investigated the effect of various sulfenamide compounds as vulcanization accelerators with an aim to find a correlation between their vulcanization activity and chemical structure. Representatives of the two classes of these compounds, namely derivatives of the mercaptobenzothiazole and dimethyldithiocarbamic acid, were studied. The effectiveness of their action as accelerators was investigated on mixtures which consisted of butadiene-styrol rubber (SKS-30A). The effect of accelerators on the kinetics of vulcanization is shown in Figure 1 according to data of sulfur addition, in Figure 2 according to the changes in solubility in chloroform, and in Figure 3 according to the changes in the value of the equilibrium module. The kinetic curves of vulcanization presented in Figures

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SOV/80-32-4-34/47

On the Problem of the Effect of the Chemical Structure of Sulfenamide Compounds  
on Vulcanization Activity

1 and 2 show the presence of an initial delayed period of vulcanization. Therefore, the authors conclude that this peculiarity prevents the phenomenon of premature vulcanization and ensures a more lasting staying of the mixtures in the visco-flowing state, which is of importance for manufacturing monolithic multi-layer items. The application of the described accelerators of vulcanization is considered as technologically expedient, for instance in the manufacture of tire treads.

There are 12 graphs, 1 table and 7 references, 5 of which are Soviet and 2 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute for Tire Industry)

SUBMITTED: December 11, 1957

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5(4), 15(9)  
AUTHORS:

SOV/76-33-G-35/44  
Tutorskiy, I. A., Ginzburg, L. V., Dogadkin, B. A.

TITLE:

On the Decomposition Mechanism of Disulphides Under Conditions of Vulcanization (O mekhanizme raspada disulfidov v usloviyakh vulkanizatsii)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 6, pp 1401-1408 (USSR)

ABSTRACT:

The decomposition mechanism of organic disulphides used as vulcanization accelerators has been insufficiently clarified up to now. It is assumed that a decomposition only takes place on the weaker S-S bindings, and not on the C-S bindings, which has been recently doubted. In the present paper, the decomposition mechanism of the 2,2'-dibenzothiazolyldisulphide (I) (altax, DBTDS) was investigated under vulcanization conditions by means of the S<sup>35</sup>-radioisotope. Mixtures of purified Na-butadiene rubber (SKB-50 Shch (for feedstuffs)) containing 1 and 2 parts by weight of (I) to 100 parts of rubber (R) were exposed to vulcanization. In the vulcanization without sulphur, (I) was used on the disulphide bridge marked with S<sup>35</sup>. The quantity of (I) deposited on (R) was determined radiometrically (Ref 8), whereby the S-quantity deposited.

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SOV/76-33-6-36/44

On the Decomposition Mechanism of Disulphides Under Conditions of  
Vulcanization

from the S-S binding was determined; whereas the total quantity of deposited S was determined by a chemical method. The results obtained show that the quantity of total sulphur exceeds that from the disulphide bridge by more than 2, which points to an asymmetric decomposition of (I). In a vulcanization without sulphur with (I) it seems that, besides the decomposition on the S-S binding, also an asymmetric decomposition on the C-S binding takes place, which also applies to the vulcanization with sulphur (besides (I)). The reaction of the (I) deposition, and that of the sulphur on (R), occur in parallel, and there is a linear function between the quantity of bound S and that of (I). The velocity constant for the (I) deposition on (R) rises linearly with the concentration of (I), but there is a limiting value for the added quantity of (I) (about 75% of the added quantity of (I)), which is independent of the concentration of (I). Data on the composition of the (R)-mixture (Table 1), on the vulcanization with S besides (I) (Table 2), as well as on the distribution of radioactivity between the vulcanizate and the extract

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On the Decomposition Mechanism of Disulphides Under Conditions of  
Vulcanization

SOV/76-33-6-36/44

(Table 3) are given. There are 6 figures, 3 tables, and  
14 references, 11 of which are Soviet.

ASSOCIATION: Institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova  
Moskva  
(Institute of Chemical Fine Technology imeni M. V. Lomonosov  
Moscow)

SUBMITTED: December 23, 1957

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S/138/59/000/011/002/011  
A051/A029

15.9210 also 2109, 2209

AUTHORS: Tarasova, Z. N.; Fedorova, T. V.; Dogadkin, B. A.

TITLE: The Effect of the Vulcanization Temperature on the Structure and Properties of Vulcanizates Made of Butadiene-Styrene and Isoprene Rubbers

PERIODICAL: Kauchuk i Rezina, 1959, No. 11, pp. 7-14.

TEXT: The temperature effect (between 133 and 200°C) on the structure of CKC-30AM (SKS-30AM), CKM (SKI) and vulcanizates was studied in order to find a way to intensify the vulcanization process and obtain rubber resistant to high temperatures. The thermal and thermo-oxidizing treatment of the butadiene-styrene rubbers at 200°C causes structuralizing. The effect of the structuralizing was evaluated by the magnitude of maximum swelling and from the physico-mechanical properties. Figure 1 indicates that the presence of admixtures in the rubbers affects the structuralizing process. The SKS-30AM rubbers, extracted with ethanol-toluene have a higher rate and degree of structuralizing. It is found that the structuralizing greatly increases with the introduction of carbon blacks into the SKS-30AM-based

S/138/59/000/011/002/011  
A051/A029

The Effect of the Vulcanization Temperature on the Structure and Properties  
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rubber mixtures, whereby the channel carbon black causes the greatest effect. An infrared spectral analysis of commercial and purified SKS-30AM was conducted, over a period of 6 hours, and it was seen that both vulcanizates exhibit only slight oxidation as compared to the initial rubber. The unsaturation of the rubber greatly decreased as a result of heating. The data of the infrared spectra show that the presence of the 1,4 double bonds decreases in unpurified commercial rubber from 79 to 29% and in the extracted rubber to 32% (Table 1). This is due to the formation of intra-molecular cyclic structures and to oxidation, and not to the polymerization processes taking place, since the number of formed transverse bonds corresponds to the loss of no more than 2% of the double bonds, if it is considered that the process takes place completely along these bonds. Further studies were made on vulcanizates from SKS-30AM rubber, obtained with various accelerators, as to the effect of temperatures within the range of 133-173°C on the structure and properties of these vulcanizates. It was seen that in the vulcanization of non-filled mixtures from SKS-30AM and SKI with sulphenamide accelerators a clearly expressed reversion takes place which is

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intensified with an increase in the vulcanization temperature. This reversion depends mostly on the destruction of the transverse sulfur bonds under the effect of the amines forming due to the decomposition of the accelerators and also on the acceleration of the thermooxidizing processes under the effect of the forming mercaptanes. A decrease of the reversion and an improvement of properties of SKS-3OAM and SKI is observed with an increase in the vulcanization temperature if sulphenamide accelerators are used, applying the vulcanization system containing NN-diethyl-2 benzothiazole sulphenamide and tetramethylthiurammonosulfide. There are 3 tables, 7 sets of graphs and 8 references: 6 Soviet, 2 English. ✓

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute of the Tire Industry)

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5 (1), 5 (2), 5 (3)

AUTHORS:

Fel'dshteyn, M. S., Eytingon, I. I.,  
Dogadkin, B. A.

SOV/20-128-4-28/65

TITLE:

The Vulcanization Effect of 2-Mercaptobenzothiazol Derivatives

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 4, pp 736 - 739  
(USSR)

ABSTRACT:

The problem of finding vulcanization systems, particularly vulcanization accelerators, with given properties is complicated by the fact that the influence of the chemical structure of these accelerators on their vulcanization activity has not yet been clarified. Therefore, experimental investigations in this respect are interesting both from a theoretical and practical point of view. The present paper investigates the vulcanization effect of several, chemically different sulphene-amide derivatives of the substance mentioned in the title (see Scheme). They were: N,N-diethyl-2-benzothiazol-sulphene amide (1), N-oxy-diethylene-2-benzothiazol-sulphene amide (2), N-cyclohexyl-2-benzothiazol-sulphene amide (3), N,N-dicyclohexyl-2-benzothiazol-sulphene amide (4), and N-phenyl-2-benzothiazol-sulphene amide (5). Figure 1 (Curve 3) shows that, by use of (2), the induction period of the vulcanization is more distinct.

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ly marked than by use of (1) and (3) (Curves 1 and 2). A considerable extension of the induction period is observed in the transition from (3) to (4) (Curve 4). The vulcanization activity is also reduced by replacing the cyclohexyl radical by a phenyl radical. Thus, it was proved that - by introducing radicals of different structure into the amino group of benzothiazol-sulphene amides - accelerators can be produced which considerably differ from each other with respect to their vulcanization activity. This applies particularly to the duration of the induction period of vulcanization. A thesis established by the authors is of interest, according to which a rapid acceleration of vulcanization in the initial stage is observed on transition from the sulphene-amide compounds with a character-

istic group  $\begin{array}{c} | \\ -S-N- \end{array}$  to compounds containing the groups

$\begin{array}{c} | \\ -S-C-N- \end{array}$  (Fig 2). The data on the change in maximum

swelling, also mentioned here, show that the structuration effect appears at an earlier vulcanization stage in the presence

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of 2-mercaptobenzothiazol derivatives as compared with sulphene-amide compounds. This regulation possibility of the vulcanization dynamics by suitable accelerators is of high technical importance. The use of accelerator (2) preferably used as against (1) for rubber mixtures with highly disperse furnace soot is finally discussed. The resulting vulcanization kinetics also favors the higher binding strength of multilayered rubber products (Ref 4), and increases the resistance of the vulcanizates to repeated deformation (Ref 1). There are 3 figures, 1 table, and 4 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti  
(Scientific Research Institute of the Tire Industry)

PRESENTED: May 26, 1959, by A. A. Balandin, Academician

SUBMITTED: May 26, 1959

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Alkyd resins with a base of polyglycols and polyglycerols.  
P. I. Dmashiev and L. A. Bogudkina. *J. Applied Chem.*  
(U. S. S. R.) 14, 110-18 (in French, 119) (1941); cf. C. A.  
35, 3405. — Diethylene glycol was prepd. in 95% yield  
from a mixt. of glycol and ethylene oxide in a sealed tube  
with 0.15%  $H_2SO_4$  (d. 1.84). A 10% yield was obtained by  
heating glycol in a stream of  $CO_2$  for 18 hrs. Polyglycerol  
lath close to lath. p. in a current of  $CO_2$ , raising the temp.  
gradually to 280° and heating for 35 hrs., and heating  
20 g. of the product thus obtained in an open flask on an  
air bath to 230-240° for 47 hrs. The polyglycerol had d<sub>4</sub><sup>20</sup>  
1.2862,  $n_D^{20}$  1.4055 and mol. wt. 177. The alkyd resin  
was prepd. by heating glycerol (or polyglycerol, glycol  
or polyglycol, oil (or fat acids of the oil) and the catalyst  
(galena) in round-bottom flasks with agitation, cooling  
the reaction mass and adding phthalic anhydride at 180°  
and then heating to the required point. The oil-soluble  
resins are softer but the films are more elastic. Resins with  
a glycol base are solid and those with a polyglycol base are  
almost liquid. In the glycerol and polyglycerol resins the  
reverse is true; this is attributed to the tri-dimensional  
structure of the glycerol esters. The rapid gelatinization  
of alkyd resins from polyglycerol may be due to a relatively  
high reactivity of polyglycerol, higher mol. wt. and greater  
viscosity as compared with glycerol. The films are formed  
more rapidly and are stronger when prepd. from glycerol  
resins than when prepd. from polyglycerol resins. Alkyd  
resins from glycerol and from polyglycerol do not form films  
under these conditions. Seventeen references.

A. A. Boettingh

KLYUYEV, V.N.; DOGADKINA, I.A.

Use of chlorine-containing diphenyl alkanes as active azo- and  
diazo-components in the formation of insoluble dyes on fibers.  
Izv. vys. ucheb. zav.; tekhn. tekst.prom. no.1:98-103 '65. (MIRA 18:5)

1. Ivanovskiy khimiko-tekhnologicheskij institut.

*DOGADKINA, L.A.*  
KLYUYEV, V.N.; DOGADKINA, L.A.; SOLODUSHENKO, S.N.; SPRYSKOV, A.A.

Azo dyes from amino carbanilide, and its substitutes. Zhur. prikl.  
khim. 31 no.1:124-129 Ja '58. (MIRA 11:4)

1. Ivanovskiy khimiko-tekhnologicheskij institut.  
(Azo dyes) (Carbanilide)



KLYUYEV, V.N.; DOGADKINA, L.A.

Using 4,4-dioxydiphenylalkanes as azo components in ice dyeing.  
Report No.2. Izv.vys.ucheb.zav.; tekhn.tekst.prom. no.5:113-116  
'61. (MIRA 14:11)

1. Ivanovskiy khimiko-tekhnologicheskii institut.  
(Dyes and dyeing—Cellulose)

ACC NR: AP6009266 (A) RM

SOURCE CODE: UR/0324/65/000/005/0100/0104

AUTHOR: Klyuyov, V. N.; Dogadkina, L. A.

ORG: Ivanov Chemical Engineering Institute (Ivanovskiy khimiko-tekhnologicheskii institut)

TITLE: Naphtholsulfanilides as azo constituents for forming insoluble hydroxyazo dyes on capron

SOURCE: IVUZ. Tekhnologiya tekstil'noy promyshlennosti, no. 5, 1965, 100-104

TOPIC TAGS: organic sulfur compound, organic azo compound, dye chemical, dyestuff, textile

ABSTRACT: Several 2-naphtholsulfanilides were compared with 2,3-hydroxynaphthoic acid anilide (Azotol A) as the azo constituents for forming insoluble hydroxyazo dyes on capron. 2-Naphtholsulfanilide-6, 2-naphtholsulfanilide-4, 2-naphtholdisulfanilide-3, 6 and 2-naphthol-N-ethylsulfanilide-6 were sorbed from alkaline solution pH8 by capron about five times better than was Azotol A. They are fixed as naphtholates, active to combine with any of the widely used diazoles to give a wide range of intense colors of satisfactory strength. The compounds examined dissolve in alkali. Thus the process problems encountered in preparing suspensions of Azotol A, and the different shading inevitable when dyeing with suspensions are avoided. Orig. art. has: 3 tables, 1 figure and 2 formulas.

SUB CODE: 07, 11/ SUBM DATE: 03Apr65/ ORIG REF: 003/ OTH REF: 005

Translation from: Referativnyy zhurnal, Mekhanika, 1957, Nr 8, p 81 (USSR) SOV/124-57-8-9145

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TITLE: Vertical Velocities Within a Stationary Frontal Zone (Vertikal'nyye skorosti v oblasti statsionarnogo fronta)

PERIODICAL: Tr. Tsentr. in-ta prognozov, 1956, Nr 45(72), pp 65-73

ABSTRACT: The influence of friction in the frontal zone and the atmospheric surface layer on the formation of vertical air movements in the vicinity of a frontal surface is investigated. The case of stationary fronts ( $du/dt=dv/dt=0$ ) is examined, for which the solution of the equation

$$\eta \frac{\partial^2 s}{\partial z^2} + i \ell s = \pi(z) \quad (\eta = \text{const}), \text{ where } (s = u + iv, \quad \pi(z) = \frac{1}{\rho} \left[ \frac{\partial p}{\partial x} + i \frac{\partial p}{\partial y} \right])$$

is sought for the following boundary conditions: 1) At the ground surface, adhesion ( $s=0$ ); 2) at infinity, a finite velocity. Having written the solutions for  $u$  and  $v(s)$ , the authors compute the derivatives  $\partial u / \partial x$  and  $\partial v / \partial y$  and determine the vertical velocity  $w$  from the equation of continuity. The formulas

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obtained are used to calculate roughly the vertical velocities on either side of the frontal surface for 50-m height intervals at various frontal elevations (0, 500, 700, and 1000 m). It is noted that the surface layer exerts a considerable influence on the vertical velocities in the frontal region at small frontal elevations.

V. P. Sadokov

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